# Shipshewana Lake Aquatic Vegetation Management Plan Update
# Lagrange County, Indiana

## 2007- 2011

http://129.79.145.7/arcims/statewide%5Fmxd/viewer.htm

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# Executive Summary

On May 3, 2007 Shipshewana Lake was treated for control of Eurasian watermilfoil (EWM) with an herbicide called Sonar at a rate of 6 parts per billion. The Shipshewana Community Lake Improvement Association privately funded the addition of 2 parts per billion of Sonar to prevent coontail (a native species) from increasing dramatically in 2007 once the Eurasian watermilfoil was removed.

Two aquatic vegetation surveys were conducted during 2007 to monitor changes in the plant community as a result of this treatment. The first survey was conducted prior to treatment on May 3, 2007 and the second was conducted on August 17, 2007. The August vegetation survey found that Eurasian watermilfoil had been reduced to the point that it was undetectable in Shipshewana Lake. The coontail population was reduced from a site frequency of 73.3% on May 3, to 36.7% on August 17, 2007.

Dissolved oxygen readings taken during the August vegetation survey showed that oxygen levels were adequate to support fish life, and no fish kills or negative impacts to the fish population were observed in 2007. Planktonic algae was very prevalent throughout the lake in summer of 2007 as has been the case in years past.

As outlined in the 2006 management plan, poor water quality will likely prevent many native plants from colonizing areas previously infested by Eurasian watermilfoil. Coontail a native plant which does very well in nutrient rich water will likely continue to be the most dominant plant in Shipshewana Lake.

No herbicide treatments will be allowed on Shipshewana Lake in 2008 other than spot treatments for any areas of Eurasian watermilfoil re-growth. This will give native plants a chance to re-establish themselves. Based on results from other whole lake Sonar treatments, only minimal re-growth of Eurasian watermilfoil is expected in 2008. Funding should be set aside to treat these areas. In keeping with the three year plan for Shipshewana Lake, $1,875 dollars should be set aside in 2008 to treat up to 5 acres of Eurasian watermilfoil re-growth.

| **Project** | **2007** | **2008** | **2009** | **3 Year Cost Totals** |
|---|---|---|---|---|
| **Whole Lake Fluridone Treatment - 6ppb** | | | | |
| Total Estimated Costs | $ 26,300 | $0 | $0 | **$ 33,250** |
| LARE share – subject to availability | $ 23,670 | | | **$ 27,045** |
| Association's Share | $ 2,630 | | | **$ 6,205** |
| **Additional 2 ppb to Control Coontail**<br>Additional Cost to Association (Not Eligible for LARE Funding) | $3,200 | | | |
| **Follow Up Spot Treatments using 2, 4-D** | | Up to 5 acres if needed | | |
| Total Estimated Costs | $0 | $ 1,875 | $ 1,875 | |
| LARE Share – subject to availability | | $1687.50 | $1687.50 | |
| Association's Share | | $187.50 | $187.50 | |

## Acknowledgements

Aquatic vegetation surveys conducted on Shipshewana Lake were made possible by funding from the Shipshewana Community Lake Improvement Association and the Indiana Department of Natural Resources through the Lake and River Enhancement program (LARE). Aquatic Weed Control would like to extend special thanks to Indiana Department of Natural Resources (IDNR) District 3 biologist Jed Pearson for providing procedural training for both Tier I and Tier II aquatic vegetation surveys. Gwen White and Angela Sturdevant, aquatic biologists for the LARE program provided valuable consultation regarding the requirements and objectives of this lake management plan. District 2 Fisheries Biologists Neil Ledet and Larry Koza also provided valuable input and consultation regarding management strategies at Shipshewana Lake. Brad Fink and Jason Doll provided assistance and training for data analysis computer programs. Aquatic Weed Control would also like to thank the members of the Shipshewana Community Lake Improvement Association for their commitment to improving this lake and for valuable discussion and input brought forward at the informational meeting held on June 23, 2007.

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## 1.0 Introduction

The first aquatic vegetation survey conducted by Aquatic Weed Control on Shipshewana took place on May 17, 2007. In summer of 2006, approximately 15 acres of Shipshewana Lake were treated with 2, 4-D to try to alleviate severe matting of Eurasian watermilfoil and coontail in the south end of Shipshewana Lake. At this time Shipshewana Lake did not have a completed vegetation management plan, and no funding was available for a whole lake treatment. Based on 2006 survey results, a whole lake Sonar treatment was proposed by Aquatic Weed Control and accepted by IDNR biologists. On May 3, 2007, the entire lake was treated with Sonar to control Eurasian watermilfoil (EWM) and reduce the coontail population. After the Sonar treatment, Eurasian watermilfoil was not found in the late season plant survey of 2007. In 2008, no herbicide treatments will be conducted on the main lake, giving native plants a chance to re-colonize areas of previous EWM infestation. The following chart summarizes all LARE funded activities on Shipshewana Lake.

**Table 1: Shipshewana Lake LARE History**

| Year | Action | Date | Funding Source |
|---|---|---|---|
| 2006 | Spring and Late Season Aquatic Vegetation Surveys<br><br>15 acres treated for EWM with 2, 4-D<br><br>Management Plan Development | Spring Survey<br>May 17, 2006<br><br>July 12, 2006<br><br>Late Season Survey<br>August 2, 2006 | Lake and River Enhancement<br><br>Shipshewana Community Lake Improvement Association |
| 2007 | Whole Lake Sonar Treatment<br><br>Aquatic Vegetation Surveys and Management Plan Update | Spring Survey<br>May 3, 2007<br><br>Sonar Treatment<br>Mary 3, 2007<br><br>Late Season Survey<br>August 17, 2007 | Lake and River Enhancement<br><br>Shipshewana Community Lake Improvement Association |

Table 2 is provided for reference regarding plant names commonly used in this document.

**Table 2: Scientific Names of Submersed Aquatic Plants**

| Scientific Name | Common Name |
|---|---|
| *Myriophyllum spicatum* | Eurasian Watermilfoil |
| *Ceratophyllym demersum* | Coontail |
| *Potamogeton pectinatus* | Sago Pondweed |
| *Potamogeton foliosus* | Leafy Pondweed |

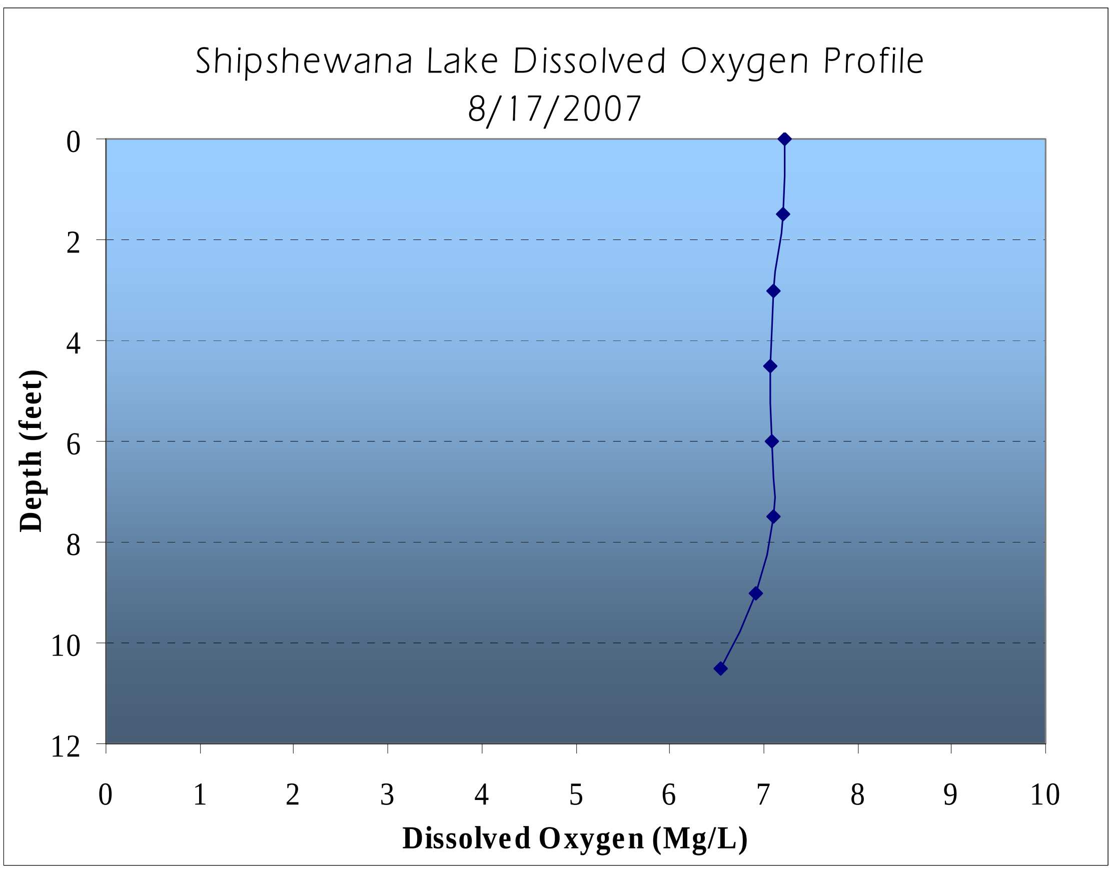
## 2.0 Watershed and Lake Characteristics Update

Shipshewana Lake is located in western Lagrange County, near the town of Shipshewana, Indiana. It has 202 surface acres with a maximum depth of 14 feet and an average depth of 7 feet (Tyllia, 2000). Cotton Lake Ditch is the lake's major inlet entering from the south (Koza, 2002). The lakes outlet is Page Ditch which exits the lake along the east shore and flows into Taylor Lake and The Pigeon River.

Shipshewana Lake has had a history of poor water quality and high levels of nutrient loading. In 1983, a request was submitted to the Indiana Department of Environmental Management to evaluate the Shipshewana Lake watershed (Koza, 2002). International Science and Technology conducted a feasibility study to improve water quality at Shipshewana Lake. This study recommended that dredging should take place to remove excess sediment from the lake. The dredging project was conducted in 1999, and removed approximately 227, 500 cubic yards of sediment from Shipshewana Lake. However, the project was never completely finished, due to a lack of funding. Total costs for the project was around $2.4 million (Koza, 2002).

Dissolved readings were taken By Aquatic Weed Control on August 17, 2007. The results of these readings are outlined in Figure 1.

**Figure 1: Shipshewana Lake Dissolved Oxygen Profile**

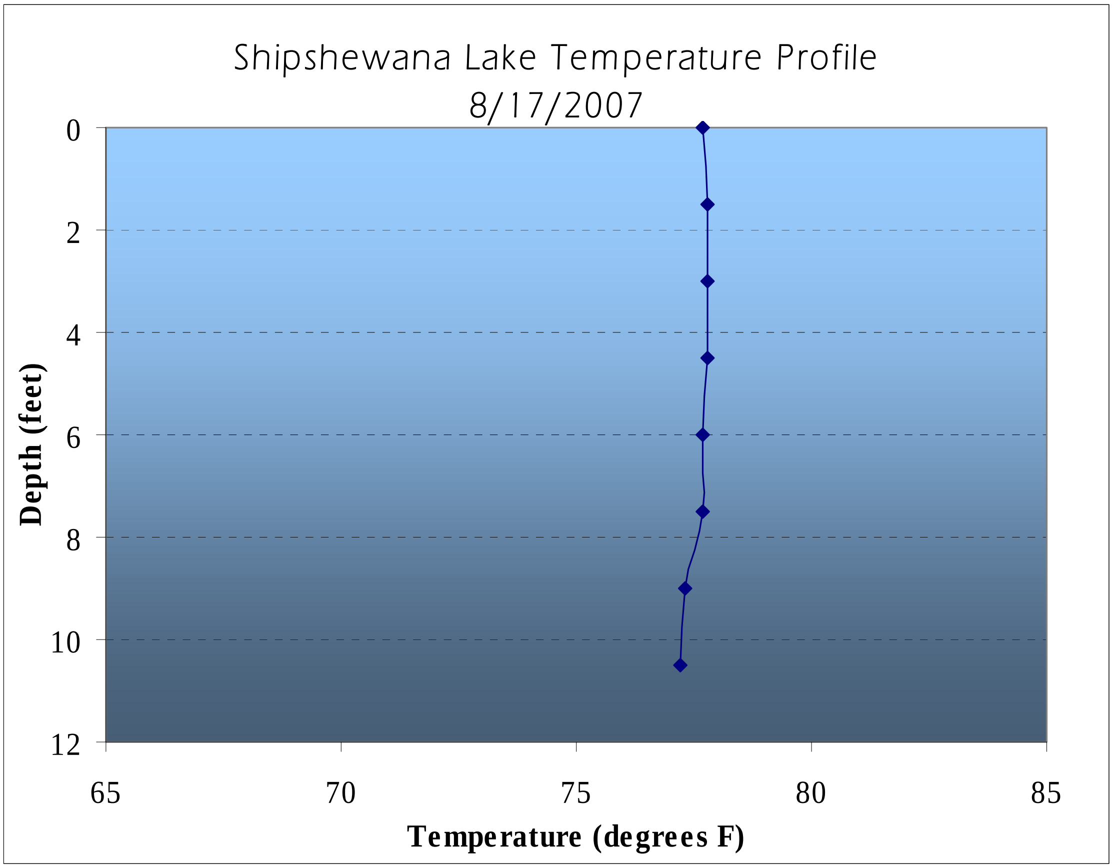


Dissolved oxygen requirements to maintain healthy fish populations of warm-water species are at least 2-5 mg of oxygen per liter of water, while cold-water fish species require 5-9 mg of oxygen per liter of water (Kalff, 2002, p237).

The metalimnion is the transition zone between the surface water and the deep water. It is usually accompanied by rapid changes in dissolved oxygen and temperature. Shipshewana showed no stratification, as no rapid loss of dissolved oxygen was observed. On August 17, 2007, Shipshewana Lake had adequate oxygen to support fish life down to at least 11 feet.

Figure 2 shows temperature readings for Shipshewana Lake.

**Figure 2: Shipshewana Lake Temperature Profile**




The thermocline is a rapid temperature change associated with the transition from surface water to deep water. In Shipshewana Lake water temperature remains stable from the surface down to 11 feet. This indicates that no thermocline was present at the time these measurements were taken.

## 3.0 Lake Uses Update

Shipshewana Lake has 2 public access points. One DNR public access site is located on the south shore of the lake and has very limited parking. A newer boat ramp has been constructed on the west shore of the lake with a larger parking area. The new boat ramp will increase public access to Shipshewana Lake. Figure 3 shows the west boat ramp at Shipshewana Lake.

**Figure 3: Shipshewana Lake West Access Site**


Based on survey data, personal observation, and comments from lake residents, public access to the lake was greatly improved by the whole lake sonar treatment. Prior to treatment, excessive vegetation significantly impaired boat travel from the north end of the lake to the south end of the lake. After treatment, both fishermen and other boaters could move more easily from one end of the lake to the other. Drift fishing for panfish is very popular on Shipshewana Lake. Areas of matted vegetation made this practice very difficult in many areas of the lake prior to treatment. Figure 4 shows fishing boats on Shipshewana Lake after treatment in August of 2007.

**Figure 4: Drift Fishing on Shipshewana Lake**

## 4.0 Fisheries

District 2 Fisheries Biologist Neil Ledet was contacted to determine the most recent fisheries survey data for Shipshewana Lake. Six fisheries surveys have been conducted on Shipshewana Lake. These surveys have taken place in 1968, 1975, 1983, 1986, 1989, and 2002. The most recent fisheries survey (June 3-7, 2002) used electro-fishing, gill nets, and trap nets to collect 1424 fish with a total weight of 917 pounds (Koza 2002).

Fifteen species of fish were collected, with black crappies being the most abundant fish by number (34%), and carp having the largest total weight (36.2%). Bluegills were the second most abundant fish by number (28.3%), and golden shiners were third at 8.4%. Yellow perch were fourth in abundance at 7.4 % and largemouth bass were fifth at 7.3%.
Of the 104 largemouth bass collected, 9.6 percent were of harvestable length. Growth rates for all bass except for age IV + fish were above average for northern Indiana Lakes.

Northern Pike were stocked in Shipshewana Lake in 1985 and 1987. Initially, the pike population was stable, and 24 fish were collected in the 1989 survey, ranging from 17.7 to 33.0 inches. However, no northern pike were collected in the most recent fisheries survey Koza (2002).Table 2 summarizes the most recent fisheries survey conducted by the IDNR.

**Table 3: 2002 IDNR Fisheries Survey Data**

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT

| *COMMON NAME OF FISH | NUMBER | PERCENT | LENGTH RANGE (inches) | WEIGHT (pounds) | PERCENT |
|---|---|---|---|---|---|
| Black crappie | 487 | 34.2 | 2.7-10.2 | 111.49 | 12.2 |
| Bluegill | 403 | 28.3 | 2.1-9.2 | 79.06 | 8.6 |
| Golden shiner | 119 | 8.4 | 5.4-8.3 | 12.91 | 1.4 |
| Yellow perch | 106 | 7.4 | 6.9-11.8 | 33.13 | 3.6 |
| Largemouth bass | 104 | 7.3 | 4.5-19.1 | 74.89 | 8.2 |
| White sucker | 71 | 5.0 | 10.1-19.8 | 112.00 | 12.2 |
| Common carp | 44 | 3.1 | 10.2-33.3 | 332.15 | 36.2 |
| Spotted gar | 30 | 2.1 | 11.3-35.6 | 96.08 | 10.5 |
| Yellow bullhead | 22 | 1.5 | 6.5-12.3 | 12.51 | 1.4 |
| Brown bullhead | 16 | 1.1 | 7.1-13.3 | 12.49 | 1.4 |
| Pumpkinseed | 9 | 0.6 | 3.8-6.3 | 0.83 | 0.1 |
| Bowfin | 7 | 0.5 | 18.4-27.3 | 36.24 | 4.0 |
| Warmouth | 4 | 0.3 | 4.4-4.9 | 0.28 | 0.0 |
| Channel catfish | 1 | 0.1 | 20.3 | 3.16 | 0.3 |
| Chestnut lamprey | 1 | 0.1 | 7.3 | 0.00 | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| | | 0.0 | | | 0.0 |
| Total (15 Species) | 1424 | 100.0 | | 917.22 | 100.0 |

*Common names of fishes recognized by the American Fisheries Society.

## 5.0 Problem Statement

Eurasian watermilfoil no longer dominates the Shipshewana Lake plant community. The challenge in 2008 will be to identify areas of EWM re-growth through proper vegetation survey techniques and manage them effectively with herbicide treatments. Since some EWM re-growth is expected in 2008, spot treatments should be used to manage these smaller areas, as opposed to a whole lake treatment. Spot treatments will use 2, 4-D to control Eurasian watermilfoil.

## 6.0 Vegetation Management goals and Objectives

The following management goals have been established by the IDNR for all Indiana lakes, including those applying for LARE funding. Any management practices implemented on Shipshewana Lake are to directly facilitate the achievement of these three goals:

1. Develop or maintain a stable, diverse aquatic plant community that supports a good balance of predator and prey fish and wildlife species, good water quality and is resistant to minor habitat disturbances and invasive species.
2. Direct efforts to preventing and/or controlling the negative impacts of aquatic invasive species.
3. Provide reasonable public recreational access while minimizing the negative impacts on plant and wildlife resources.

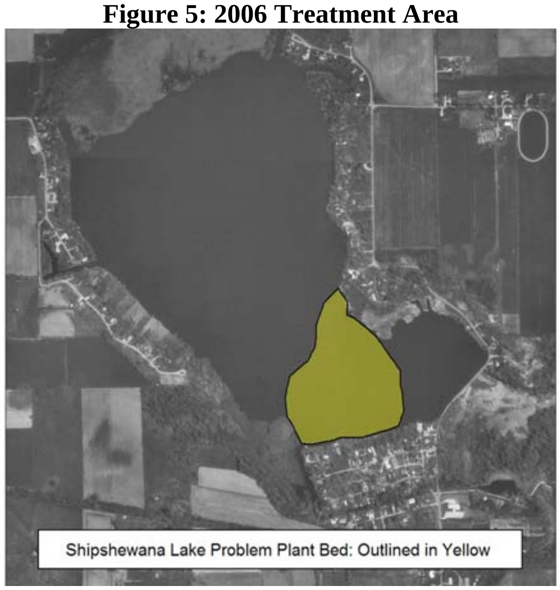
**Specific Objectives**

The major objective for Shipshewana Lake has changed from a large scale treatment effort to reduce the dominant milfoil population, to smaller scale treatments in areas where re-growth is observed in the future. These areas of re-growth will be treated with 2, 4-D herbicide.

## 7.0 Past Management Efforts

District 2 Fisheries Biologist Neil Ledet was contacted to determine any significant changes to vegetation control permits on Shipshewana Lake. The only major changes have been the LARE funded herbicide treatments. On July 12, 2006, approximately 15 acres of Shipshewana Lake were treated with 2, 4-D to alleviate severe matting of Eurasian watermilfoil and coontail in the south end of Shipshewana Lake. This treatment area was located inside the problem plant area outlined in yellow in figure 3. This dense plant bed was nearly cutting the lake in half, making it extremely difficult for a boat to travel from the public access site to the north end of the lake. This treatment was sponsored by the LARE program and the lake association to provide some temporary relief until a larger management strategy could be developed. Even after this treatment matted vegetation still impeded boat traffic. This are is outlined in figure 5.

**Figure 5: 2006 Treatment Area**



**2007 Sonar Application**

On May 3, 2007, the entire lake was treated with Sonar at a total rate of 8 parts per billion (ppb). The LARE program helped to fund a rate of 6ppb to control Eurasian watermilfoil, and gave approval for the lake association to privately fund the addition of 2 ppb to help reduce the coontail population. The herbicide was applied using underwater injection systems from 2 of Aquatic Weed Control's application boats. It was applied in a zigzag pattern over the entire lake. Sonar was also applied in the small pond that flows into Shipshewana Lake's south end to protect against re-infestation. FasTESTS were taken 3 approximately 3 weeks after treatment and found that Sonar rates in Shipshewana Lake ranged from 6 to 12 parts per billion. Because the results were slightly higher than anticipated, SePRO advised Aquatic Weed Control not to bump the concentration, but to take another Fastest later to ensure that the herbicide was remaining in the water column. A second round of FasTESTS were collected on June 8, and still showed Sonar concentrations from 1.3 to 3.1 parts per billion, so a bump was not recommended.

Sonar works by prohibiting the plant from making chlorophyll, which in turn prevents the plant from making food. This whitening of plant material due to a lack of chlorophyll is called chlorosis. Figure 6 shows coontail collected from Shipshewana Lake approximately 3 weeks after treatment. This coontail was exhibiting Sonar damage, as indicated by the whitening of the leaves.

**Figure 6: Coontail Showing Chlorosis from Sonar**

Before the whole lake Sonar treatment, herbicide applications were limited to contact herbicides applied along lake frontages at the request of property owners. These treatments have been very limited. One area treated on a regular basis is the beach area for the Brethren Camp on Shipshewana Lake. Other treatments are very sporadic and usually only involve 50-100 feet of frontage.

## 8.0 Aquatic Plant Community Characterization

One major change in protocol for 2007 is the absence of the Tier I reconnaissance survey. Survey intensity is now being tailored to individual lakes, depending on their own unique set of circumstances and management activities. Some lakes which may have been surveyed twice annually in the past may only be surveyed once each season. Surveys on some lakes that have been intensely surveyed in recent years may change to visual surveys as opposed to more time consuming quantitative vegetation surveys. These changes provide better quality of service and more efficient use of funding on Indiana lakes.

An updated Tier II survey protocol has been established by the IDNR. These changes are outlined in the methods section (8.1).

## 8.1 Methods Update

The Tier II survey protocol was updated by the IDNR in 2007. New LARE Tier II protocol requires that sample sites be stratified by depth contour, and that data analysis be provided for each depth contour. Rake scores for plant species are recorded as 1, 3, or 5, as opposed to the original scoring system of 1, 2, 3, 4, or 5.

The number of sample sites needed for a Tier II survey still is based on both lake size and trophic state, as it was in 2006. Trophic state describes the productivity of a lake and is correlated with plant growth, secchi disk, and nutrient availability. There are 4 different trophic states listed by the IDNR: Oligotrophic, Mesotrophic, Eutrophic, and Hypereutrophic. Oligotrophic Lakes usually have clear water and few nutrients, while Hypereutrophic lakes usually have deeply stained water and are nutrient rich. Table 3 is taken from the IDNR 2006 Tier II protocol and shows the maximum depth that must be sampled for a lake in each trophic state. In oligotrophic lakes, where water is clear, plants may be able to grow in up to 25 feet of water because sunlight may still reach the lake bottom in deep water. In hypereutrophic lakes where water is turbid, lack of sunlight will prevent plants from growing in deep water, so the maximum sampling depth is only 10 feet.

**Table 2: Sample Depth by Trophic State**

| Trophic State | Maximum Depth of Sampling (ft) |
|---|---|
| Hypereutrophic | 10 |
| Eutrophic | 15 |
| Mesotrophic | 20 |
| Oligotrophic | 25 |

Table 4 is used to calculate the number of sample sites need in each depth contour by using lake size and trophic status. The new protocol attempts to more accurately describe the entire littoral zone of a lake and provide more detailed data analysis by separating the littoral zone into 5 foot depth segments.

**Table 3: Sample Sites by Lake Size and Trophic State**

Tier II Sampling 3

Table 3. Sample size requirements as determined by lake size, trophic state, and apportioned by depth class.

| | | Hypereutrophic | | Eutrophic | | | Mesotrophic | | | | Oligotrophic | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lake Acres | Total # of Sites | 0-5 foot contour | 5-10 foot contour | 0-5 foot contour | 5-10 foot contour | 10-15 foot contour | 0-5 foot contour | 5-10 foot contour | 10-15 foot contour | 15-20 foot contour | 0-5 foot contour | 5-10 foot contour | 10-15 foot contour | 15-20 foot contour | 20-25 foot contour |
| <10 | 20 | 10 | 10 | 10 | 7 | 3 | 10 | 5 | 3 | 2 | 10 | 4 | 3 | 2 | 1 |
| 10-49 | 30 | 20 | 10 | 10 | 10 | 10 | 10 | 10 | 7 | 3 | 10 | 10 | 5 | 3 | 2 |
| 50-99 | 40 | 30 | 10 | 17 | 13 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 7 | 3 |
| 100-199 | 50 | 40 | 10 | 23 | 17 | 10 | 14 | 14 | 12 | 10 | 10 | 10 | 10 | 10 | 10 |
| 200-299 | 60 | 50 | 10 | 30 | 20 | 10 | 18 | 16 | 16 | 10 | 14 | 12 | 12 | 12 | 10 |
| 300-399 | 70 | 60 | 10 | 37 | 23 | 10 | 22 | 20 | 18 | 10 | 17 | 15 | 14 | 14 | 10 |
| 400-499 | 80 | 70 | 10 | 43 | 27 | 10 | 25 | 23 | 22 | 10 | 19 | 18 | 17 | 16 | 10 |
| 500-799 | 90 | 80 | 10 | 50 | 30 | 10 | 29 | 27 | 24 | 10 | 22 | 21 | 19 | 18 | 10 |
| >=800 | 100 | 90 | 10 | 57 | 33 | 10 | 33 | 31 | 26 | 10 | 25 | 23 | 22 | 20 | 10 |

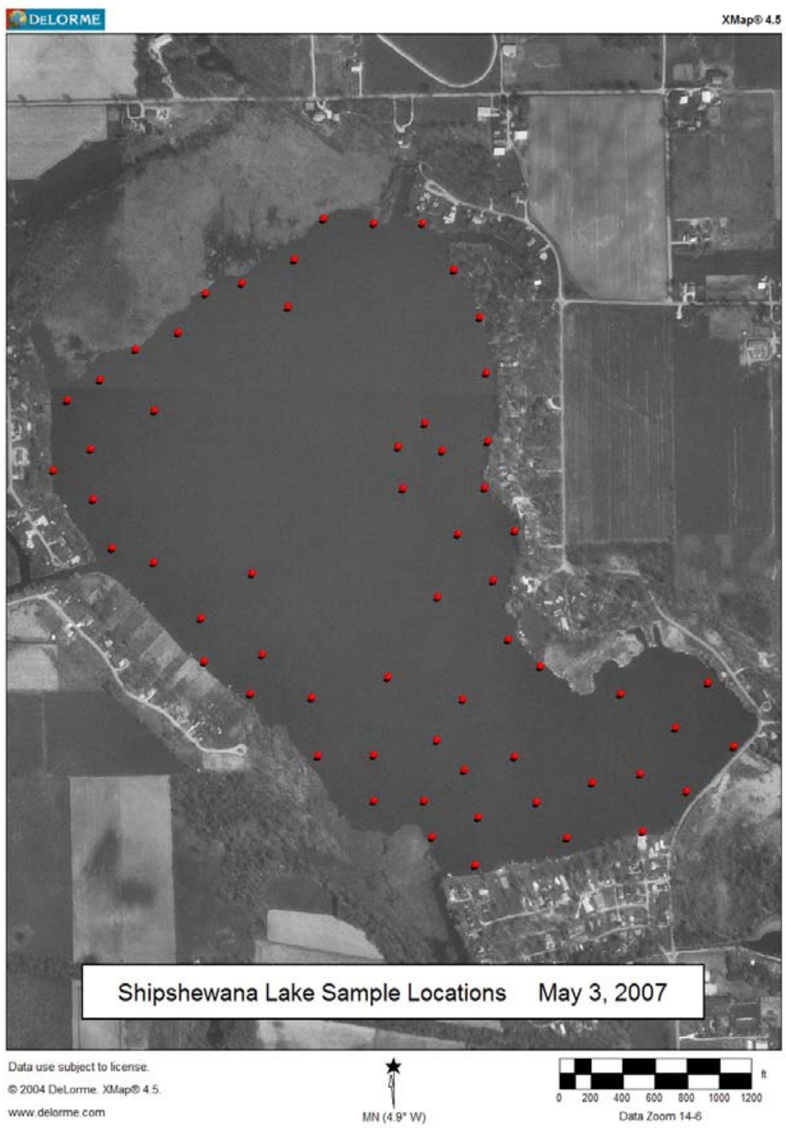
## 8.2 Results

## 8.2.2 Tier II Results

Tier II surveys were conducted on Shipshewana Lake on May 3, 2007 and August 17, 2007. Secchi disk measurements were recorded at 2.5 feet and 2.3 feet in these surveys. In both surveys, maximum plant depth was approximately 6 feet deep.

In both surveys, sixty rake samples were distributed throughout each 5 foot depth contour of the littoral zone. A total of 5 species of submersed aquatic plants were collected during the spring survey, while 2 plant species were found during the fall survey. Figure 7 shows the locations of all sample sites for the 2007 Tier II surveys.

**Figure 7: 2007 Tier II Sample Locations**



## Spring Data Analysis

Tables 4 through 9 are data summaries for the May 3, 2007 aquatic vegetation survey. These tables help to describe the plant community, and will help identify any changes that take place in the years to come. Tables labeled "Overall" include every sample site, while the other tables describe each depth contour of the lake's littoral zone (0-5 feet, 5-10 feet, etc).

**Table 4: May 2007 Data Analysis - Overall**

| Occurrence and Abundance of Submersed Aquatic Plants - Overall | | | | | |
|---|---|---|---|---|---|
| Lake: | Shipshewana | Secchi: | 2.5 | SE Mean Species/site: | 0.09 |
| Date: | 5/3/07 | Littoral sites with plants: | 46 | Mean natives/site: | 0.80 |
| Littoral depth (ft): | 6.0 | Number of species: | 5 | SE Mean natives/site: | 0.07 |
| Littoral sites: | 53 | Maximum species/site: | 2 | Species diversity: | 0.45 |
| Total sites: | 60 | Mean number species/site: | 1.03 | Native diversity: | 0.16 |

| | | | Score Frequency | | |
|---|---|---|---|---|---|
| **Common Name** | **Site Frequency** | **1** | **3** | **5** | **Dominance** |
| Coontail | 73.3 | 18.3 | 36.7 | 18.3 | 44.0 |
| Eurasian Watermilfoil | 21.7 | 11.7 | 10.0 | 0.0 | 6.7 |
| Sago Pondweed | 5.0 | 5.0 | 0.0 | 0.0 | 1.0 |
| Curly-leaf Pondweed | 1.7 | 1.7 | 0.0 | 0.0 | 0.3 |
| Elodea | 1.7 | 1.7 | 0.0 | 0.0 | 0.3 |
| | | | | | |
| Filamentous Algae | 31.7 | | | | |

**Table 5: May 2007 Data Analysis 0 - 5 Feet**

| Occurrence and Abundance of Submersed Aquatic Plants 0-5 Feet | | | | | |
|---|---|---|---|---|---|
| Lake: | Shipshewana | Secchi: | 2.5 | SE Mean Species/site: | 0.09 |
| Date: | 5/3/07 | Littoral sites with plants: | 45 | Mean natives/site: | 0.94 |
| Littoral depth (ft): | 6.0 | Number of species: | 5 | SE Mean natives/site: | 0.06 |
| Littoral sites: | 50 | Maximum species/site: | 2 | Species diversity: | 0.45 |
| Total sites: | 50 | Mean number species/site: | 1.22 | Native diversity: | 0.16 |

| | | | Score Frequency | | |
|---|---|---|---|---|---|
| **Common Name** | **Site Frequency** | **1** | **3** | **5** | **Dominance** |
| Coontail | 86.0 | 20.0 | 44.0 | 22.0 | 52.4 |
| Eurasian Watermilfoil | 26.0 | 14.0 | 12.0 | 0.0 | 10.0 |
| Sago Pondweed | 6.0 | 6.0 | 0.0 | 0.0 | 1.2 |
| Curly-leaf Pondweed | 2.0 | 2.0 | 0.0 | 0.0 | 0.4 |
| Elodea | 2.0 | 2.0 | 0.0 | 0.0 | 0.4 |

**Table 6: May 2007 Data Analysis 5 - 10 Feet**

**Occurrence and Abundance of Submersed Aquatic Plants 5-10 Feet**

| | | | | | |
|---|---|---|---|---|---|
| Lake: | Shipshewana | Secchi: | 2.5 | SE Mean Species/site: | 0.1 |
| Date: | 5/3/07 | Littoral sites with plants: | 1 | Mean natives/site: | 0.10 |
| Littoral depth (ft): | 6.0 | Number of species: | 1 | SE Mean natives/site: | 0.10 |
| Littoral sites: | 3 | Maximum species/site: | 1 | Species diversity: | 0.00 |
| Total sites: | 10 | Mean number species/site: | 0.10 | Native diversity: | 0.00 |

| | | | Score Frequency | | |
|---|---|---|---|---|---|
| **Common Name** | **Site Frequency** | **1** | **3** | **5** | **Dominance** |
| Coontail | 10.0 | 10.0 | 0.0 | 0.0 | 2.0 |

No plants were collected in the 10 -15 foot depth contour.

Tables 7 through 9 are data summaries for the August 17, 2007 aquatic vegetation survey.

**Table 7: August 2007 Data Analysis - Overall**

**Occurrence and Abundance of Submersed Aquatic Plants - Overall**

| | | | | | |
|---|---|---|---|---|---|
| Lake: | Shipshewana | Secchi: | 2.3 | SE Mean Species/site: | 0.07 |
| Date: | 8/17/07 | Littoral sites with plants: | 23 | Mean natives/site: | 0.42 |
| Littoral depth (ft): | 6.0 | Number of species: | 2 | SE Mean natives/site: | 0.07 |
| Littoral sites: | 53 | Maximum species/site: | 2 | Species diversity: | 0.21 |
| Total sites: | 60 | Mean number species/site: | 0.42 | Native diversity: | 0.21 |

| | | | Score Frequency | | |
|---|---|---|---|---|---|
| **Common Name** | **Site Frequency** | **1** | **3** | **5** | **Dominance** |
| Coontail | 36.7 | 26.7 | 10.0 | 0.0 | 11.3 |
| Sago Pondweed | 5.0 | 5.0 | 0.0 | 0.0 | 1.0 |
| | | | | | |
| Filamentous Algae | 36.7 | | | | |

**Table 8: August 2007 Data Analysis 0 - 5 Feet**

**Occurrence and Abundance of Submersed Aquatic Plants 0-5 Feet**

| | | | | | |
|---|---|---|---|---|---|
| Lake: | Shipshewana | Secchi: | 2.3 | SE Mean Species/site: | 0.08 |
| Date: | 8/17/07 | Littoral sites with plants: | 22 | Mean natives/site: | 0.48 |
| Littoral depth (ft): | 6.0 | Number of species: | 2 | SE Mean natives/site: | 0.08 |
| Littoral sites: | 50 | Maximum species/site: | 2 | Species diversity: | 0.22 |
| Total sites: | 50 | Mean number species/site: | 0.48 | Native diversity: | 0.22 |

| | | | Score Frequency | | |
|---|---|---|---|---|---|
| **Common Name** | **Site Frequency** | **1** | **3** | **5** | **Dominance** |
| Coontail | 42.0 | 30.0 | 12.0 | 0.0 | 13.2 |
| Sago Pondweed | 6.0 | 6.0 | 0.0 | 0.0 | 1.2 |
| | | | | | |
| Filamentous Algae | 44.0 | | | | |

**Table 9: August 2007 Data Analysis 5 - 10 Feet**

**Occurrence and Abundance of Submersed Aquatic Plants 5-10 Feet**

| | | | | | |
|---|---|---|---|---|---|
| Lake: | Shipshewana | Secchi: | 2.3 | SE Mean Species/site: | 0.10 |
| Date: | 8/17/07 | Littoral sites with plants: | 1 | Mean natives/site: | 0.10 |
| Littoral depth (ft): | 6.0 | Number of species: | 1 | SE Mean natives/site: | 0.10 |
| Littoral sites: | 3 | Maximum species/site: | 1 | Species diversity: | 0.00 |
| Total sites: | 10 | Mean number species/site: | 0.10 | Native diversity: | 0.00 |

| | | | **Score Frequency** | | |
|---|---|---|---|---|---|
| **Common Name** | **Site Frequency** | **1** | **3** | **5** | **Dominance** |
| Coontail | 10.0 | 10.0 | 0.0 | 0.0 | 2.0 |
| | | | | | |
| Filamentous Algae | 0.0 | | | | |

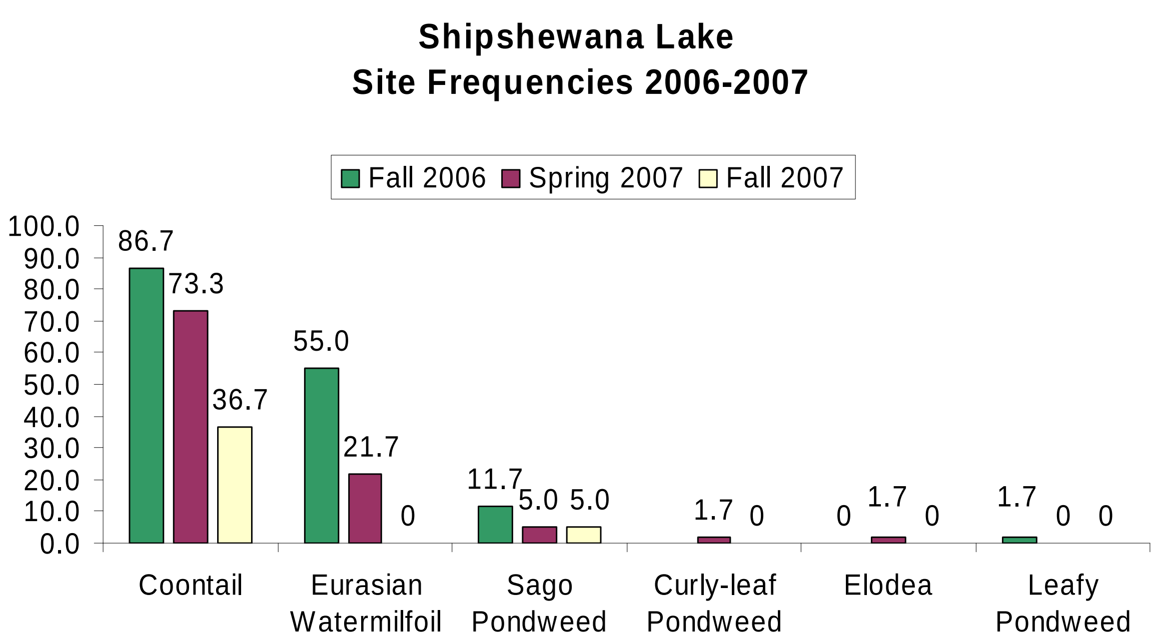
## Site Frequency

Site frequency is a measure of how often a species was collected during the Tier II survey. It can be calculated by the following equation:

$$\text{Site Frequency} = \frac{\text{(\# of sites where the species was collected)}}{\text{Total \# of littoral sample sites}} \times 100$$

Table 10 shows site frequencies for every plant collected in between fall 2006 and fall 2007. The Sonar treatment took place after the spring 2007 survey. Coontail was the most commonly collected plant in all surveys. Eurasian watermilfoil site frequency dropped from 55.0 in fall of 2006 to 0 in fall of 2007.

**Table 10: Shipshewana Lake Site Frequency History**



## Species Diversity

The species diversity indices listed in the data analysis tables help to describe the overall plant community. A species diversity index is actually measured as a value of uncertainty (H). If a species is chosen at random from a collection containing a certain number of species, the diversity index (H) is the probability that a chosen species will be different from the previous random selection. The diversity index (H) will always be between 0 and 1. The higher the H value, the more likely it is that the next species chosen from the collection at random will be different from the previous selection (Smith, 2001). This index is dependent upon species richness and species evenness, meaning that species diversity is a function of how many different species are present and how evenly they are spread throughout the ecosystem.

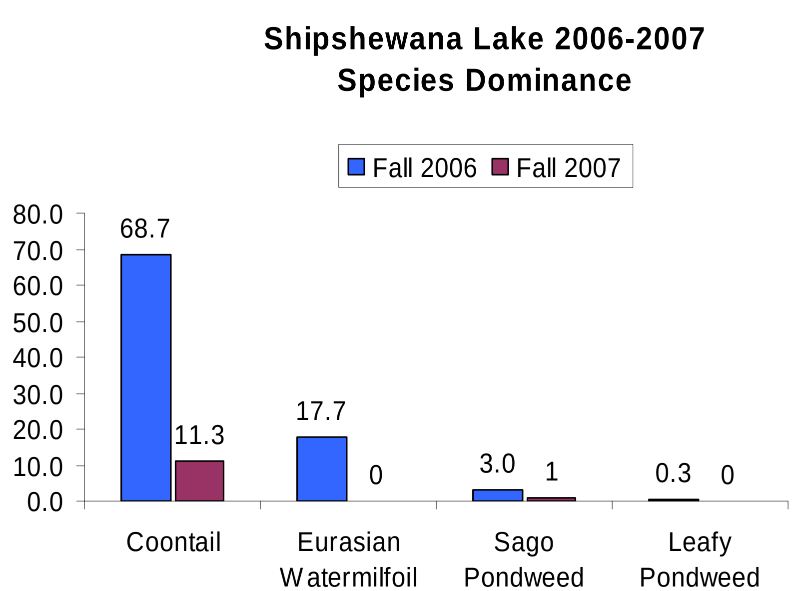
The overall species diversity index for Shipshewana Lake in August 2007 was 0.21, down from 0.56 in 2006. Both of these values are low when compared to other Indiana lakes. Native plant diversity in August of 2007 was 0.21, down slightly from 0.24 in August of 2006.

## Species Dominance

Species dominance is dependent upon how many times a species occurs, and its relative coverage area or biomass within the system. In this survey, the abundance rating given to each species at each sample site was used to determine dominance. The dominance of a particular species in this Tier II survey increases as its site frequency and relative abundance increase.

Table 11 tracks dominance values for each plant collected at Shipshewana Lake during the fall 2006 and fall 2007 surveys. Trends are similar to sight frequency, with coontail being by far the most dominant plant in the fall survey. Eurasian watermilfoil dominance dropped to 0 after treatment in 2007.

**Table 11: 2006 – 2007 Species Dominance**



## 8.3 Macrophyte Inventory Discussion

Submersed aquatic vegetation covers an estimated 114 acres, or 56% of Shipshewana Lake's total surface area. Of these 114 acres, at least 40 of them contained Eurasian watermilfoil beds prior to the whole lake Sonar treatment.

Based upon 2007 survey data, Shipshewana Lake has a very low diversity of submersed aquatic plant community when compared with many area lakes. Species richness in Shipshewana Lake was low with only 5 submersed species collected in May of 2007, and only 2 species collected in August of 2007 after treatment. Coontail is by far the most dominant species, and will likely continue its dominance. Planktonic algal blooms have historically occurred each summer, and will likely continue, giving the water lime green coloration. Figure 8 shows green planktonic algae concentrated at a windward shoreline in Shipshewana Lake.

**Figure 8: Shipshewana Lake Planktonic Algae**

As mentioned in the 2006 vegetation management plan, the nutrient rich water of Shipshewana Lake poses many challenges to vegetation management. The re-colonization of native plants in areas previously occupied by EWM may be inhibited by the turbidity of the water. Coontail, a native plant which does well in turbid water could increase to nuisance levels very quickly. Based on results of other whole lake Sonar treatments, sago pondweed abundance may be expected to increase in the lake. It is hoped that it might become dominant in areas where EWM was prevalent. However, a quick re-colonization of the lake by beneficial native plants other than coontail should not be expected.

## 9.0 Aquatic Plant Management Alternatives

Management practices for the control of EWM have not changed significantly since the 2006 lake management plan.

## 10.0 Public Involvement

A LARE meeting was held on November 8, 2007 to discuss issues pertaining to Shipshewana Lake. District 2 Fisheries Biologist Neil Ledet, a lake representative, Aquatic Weed Control and LARE Aquatic Biologist Gwen White were all present and discussed the plant community of Shipshewana Lake.

A public lake meeting was held for Shipshewana Lake on June 23, 2007. Fifteen people were in attendance. Jim Donahoe of Aquatic Weed Control summarized LARE management activities and outlined the future management strategy for maintaining the Eurasian watermilfoil population at a low level with spot herbicide treatments. Residents were pleased with the outcome of the whole lake treatments and some even said that algal blooms may have been as severe after treatment as in previous years. Figure 9 sows responses to the public questionnaire.

**Figure 9: Shipshewana Lake Public Questionnaire**

Lake Use Survey (15 total)    Lake name Shipshewana

Are you a lake property owner?    Yes 15  No 0

Are you currently a member of your lake association?    Yes 14  No 1

How many years have you been at the lake?
2 or less - 1
2 – 5 years - 3
5-10 years - 4
Over 10 years - 7

How do you use the lake (mark all that apply)

| | |
|---|---|
| 5 Swimming | 0 Irrigation |
| 13 Boating | 0 Drinking water |
| 15 Fishing | 0 Other ______ |

Do you have aquatic plants at your shoreline in nuisance quantities?    Yes 3  No 9

Do you currently participate in a weed control project on the lake?    Yes 9  No 2

Does aquatic vegetation interfere with your use or enjoyment of the lake? Yes 9  No 5

Does the level of vegetation in the lake affect your property values?    Yes 13  No 2

Are you in favor of continuing efforts to control vegetation on the lake?  Yes 14  No 0

Are you aware that the LARE funds will only apply to work controlling invasive exotic species, and more work may need to be privately funded?    Yes 13  No 1

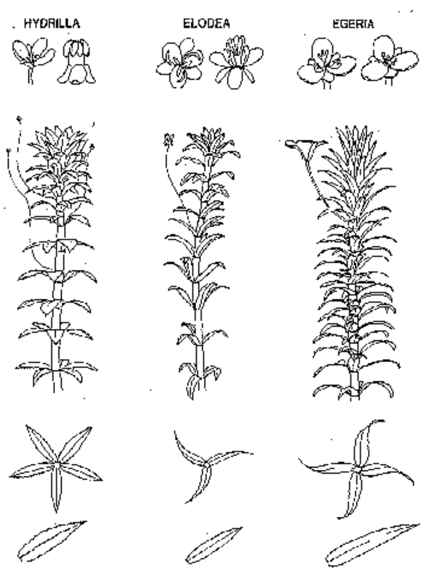
Mark any of these you think are problems on your lake:
0 Too many boats access the lake
0 Use of jet skis on the lake
0 Too much fishing
0 Fish population problem
4 Dredging needed
0 Overuse by nonresidents
6 Too many aquatic plants
0 Not enough aquatic plants
6 Poor water quality
2 Pier/funneling problem

Please add any comments:
Deeper lake = less problem; bad errosion on channel shoreline reducing property line edge - what can be done to fill tot back in to prevent further erosion; weed control has helped; 1st season of lake with aquatic treatment appears successful; 2006 efforts in July = catastrophic, end up with large biomass on southside; we're pleased with weed control this year - hopefully will continue. Need more weed banks + aquatic plants control (lilly pads + cattails).

## 11.0 Public Education

## Hydrilla

Hydrilla (*Hydrilla verticillata*) is an invasive aquatic plant species common throughout the southern United States. It it federally listed as a noxious weed and causes severe ecological and recreational problems wherever it grows. It is considered to be much more destructive than other invasives like Eurasian watermilfoil and curly leaf pondweed because of its reproductive adaptations. It grows by fragmentation, as does Eurasian watermilfoil, but it also produces turions which can remain dormant in the sediment for 4 years or more (Van and Steward, 1990). It produces tubers at its root tips which can also reproduce after multiple years of dormancy. It can grow 1 inch each day and it quickly out-competes native plants. It forms dense beds that eliminate native plants, stunt fish populations, impede recreation and cause a drastic decrease in biodiversity (Colle and Shireman, 1980). Millions of dollars are spent each year for hydrilla maintenance each year in Florida alone. Eradication is unlikely once a population has been well established, although eradication has been achieved in newly infested waters using a herbicide called Sonar. Sonar is applied at a rate of 6 parts per billion and this concentration is maintained in the water for 180 days. Early detection can be crucial to an effective eradication program, and all lake residents and users are encouraged to be on the look-out for this invader.


In fall of 2006, this plant was found in Lake Manitou, in Rochester, Indiana. This is the first instance of hydrilla in the upper Midwest. Prior to its appearance in Lake Manitou, The closest infestations of hydrilla were in Tennessee and Pennsylvania.

Hydrilla can easily be confused with native elodea. The major difference is that elodea has sets of leaves on the stem in whorls of three, while hydrilla usually has whorls of 5 leaves, although 4 to 9 leaves per whorl are possible with hydrilla. Hydrilla will also have small serrations on the leaf edges. More information on hydrilla can be found at the University of Florida's Center for Aquatic Invasive Plants (http://plants.ifas.ufl.edu/). More general information on aquatic invaders can be found at www.protectyourwaters.net.

## 12.0 Integrated Treatment Action Strategy

Eurasian watermilfoil was not found in Shipshewana Lake in fall of 2007. Based on results from other whole lake Sonar treatments, only minimal re-growth should be expected in 2008. Any areas of Eurasian watermilfoil re-growth should be identified and treated with 2, 4-D herbicide. A vegetation control permit will be submitted without a treatment map for 2008, since no re-growth has occurred to this point. The permit will request treatment of up to 5 acres of Eurasian watermilfoil. If Eurasian watermilfoil returns to the lake in 2008, it will be detected in the vegetation surveys, and spot treatments using 2,4-D would be used to control the EWM.

Maintenance of the Eurasian watermilfoil population should be the highest priority. Spot herbicide treatments should be limited to areas of Eurasian watermilfoil infestation to protect the native species that are re-colonizing the lake. Treatment of native plants along shorelines of the main lake will not be permitted in 2008. This may help give the native plants a competitive advantage over Eurasian watermilfoil.

**Herbicide Specifications**
In treatment areas on Shipshewana Lake 2, 4-D should be applied at a rate of 1.76 parts per million to achieve adequate control of Eurasian Watermilfoil.

## 13.0 Project Budget

In following the 3-year plan for Shipshewana Lake, $1,875 should be set aside to treat up to 5 acres of EWM re-growth in 2008. Treatment may not be necessary, but funds must be in place in case re-growth does occur. Up to $4,000 dollars should be set aside for survey and planning costs in 2008. This $4,000 will be eligible for a 90% cost share by the LARE program, so the association would likely be responsible to pay $400 for survey and planning costs.

Table 12 outlines cost estimates for the Sonar treatment program. These costs are estimates only and are subject to change pending future herbicide pricing.

**Table 12: Shipshewana Lake 3 Year Cost Estimates**

| **Project** | **2007** | **2008** | **2009** | **3 Year Cost Totals** |
|---|---|---|---|---|
| **Whole Lake Fluridone Treatment - 6ppb** | | | | |
| Total Estimated Costs | $ 26,300 | $0 | $0 | **$ 33,250** |
| LARE share – subject to availability | $ 23,670 | | | **$ 27,045** |
| Association's Share | $ 2,630 | | | **$ 6,205** |
| **Additional 2 ppb to Control Coontail**<br>Additional Cost to Association (Not Eligible for LARE Funding) | $3,200 | | | |
| **Follow Up Spot Treatments using 2, 4-D** | | Up to 5 acres if needed | | |
| Total Estimated Costs | $0 | $ 1,875 | $ 1,875 | |
| LARE Share – subject to availability | | $1687.50 | $1687.50 | |
| Association's Share | | $187.50 | $187.50 | |

## 14.0 Monitoring and Plan Update Procedures

In 2007 a spring visual survey will be conducted to search for any areas of Eurasian watermilfoil re-growth. Should any Eurasian watermilfoil be found, a treatment map will be submitted to the IDNR. Herbicide treatment would follow the approval of the treatment map.

A late season Tier II vegetation Survey is recommended for Shipshewana Lake in 2008. this survey will help how the plant community is responding to the whole lake treatment.

In the years that follow, additional surveys should be conducted to determine how the Eurasian milfoil population is reacting to the management strategy over a long period of time. These surveys will provide a basis for evaluation of the management strategy and can be presented to the public should the need arise to modify the management strategy. They will also serve to keep the public interested and informed about management practices at the lake so they will be motivated and equipped to actively participate in the conservation of the Shipshewana Lake ecosystem. The intensity and frequency of vegetation surveys may change from year to year. Survey and planning needs should be re-evaluated each year to reduce unnecessary cost to the lake association while still providing adequate data to characterize the plant community.

## 15.0 References

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# 16.0 Appendices

## 16.1 Calculations

Fluridone Calculations:
The following paragraph is taken directly from the Sonar A.S. label. It outlines the specific procedures for calculating the amount of Fluridone needed to treat a body of water.

### Application Rate Calculation - Ponds, Lakes and Reservoirs

The amount of Sonar A.S. to be applied to provide the desired ppb concentration of active ingredient in treated water may be calculated as follows:
Quarts of Sonar A.S. required per treated surface acre =
Average water depth of treatment site (feet)
**x** Desired ppb concentration of active ingredient
**x** 0.0027
For example, the quarts per acre of Sonar A.S. required to provide a concentration of 25 ppb of active ingredient in water with an average depth of 5 feet is calculated as follows:
5 **x** 25 **x** 0.0027 = 0.33 quarts per treated surface acre
When measuring quantities of Sonar A.S., quarts may be converted to fluid ounces by multiplying quarts to be measured **x** 32. For example, 0.33 quarts **x** 32 = 10.5 fluid ounces.
**Note:** Calculated rates should not exceed the maximum allowable rate in quarts per treated surface acre for the water depth listed in the application rate table for the site to be treated.

The following chart outlines rate calculations for DMA – 4 IVM Herbicide. It was taken directly from the DMA – 4 IVM specimen label on Dow AgroSciences website. http://www.dowagro.com/ivm/invasive/prod/dma.htm

**Submerged Aquatic Weeds: Including Eurasian Water Milfoil *(Myriophyllum spicatum)***

| Treatment Site | Maximum Application Rate † | Specific Use Directions |
|---|---|---|
| **Aquatic Weed Control in Ponds, Lakes, Reservoirs, Marshes, Bayous, Drainage Ditches, Canals, Rivers and Streams that are Quiescent or Slow Moving, Including Programs of the Tennessee Valley Authority** | 2.84 gallons (10.8 lb of acid equivalent) per acre foot | **Application Timing:** For best results, apply in spring or early summer when aquatic weeds appear. Check for weed growth in areas heavily infested the previous year. A second application may be needed when weeds show signs of recovery, but no later than mid-August in most areas.<br>**Subsurface Application:** Apply DMA 4 IVM undiluted directly to the water through a boat mounted distribution system. Shoreline areas should be treated by subsurface injection application by boat to avoid aerial drift.<br>**Surface Application:** Use power operated boat mounted boom sprayer. If rate is less than 5 gallons per acre, dilute to a minimum spray volume of 5 gallons per surface acre.<br>**Aerial Application:** Use drift control spray equipment or thickening agents mixed with sprays to reduce drift. Apply through standard boom systems in a minimum spray volume of 5 gallons per surface acre. For Microfoil® drift control spray systems, apply DMA 4 IVM in a total spray volume of 12 to 15 gallons per acre.<br>Apply to attain a concentration of 2 to 4 ppm (see table below). |

†DMA 4 IVM contains 3.8 lb of acid equivalent per gallon of product.

| Amount to Apply to Attain a Concentration of 2 to 4 ppm | | | |
|---|---|---|---|
| **Surface Area** | **Average Depth (ft)** | **2,4-D Acid Equivalent to Apply (lb/acre)** | **Amount of DMA 4 IVM to Apply (gal/acre)** |
| 1 acre | 1 | 5.4 to 10.8 | 1.42 to 2.84 |
| | 2 | 10.8 to 21.6 | 2.84 to 5.68 |
| | 3 | 16.2 to 32.4 | 4.26 to 8.53 |
| | 4 | 21.6 to 43.2 | 5.68 to 11.37 |
| | 5 | 27.0 to 54.0 | 7.10 to 14.21 |

The following table outlines rate calculations for Renovate 3 herbicide based on desired PPM and average depth of treatment area. It is taken directly from the Renovate 3 specimen label on SePRO Corporation's website: www.sepro.com

| Concentration of Triclopyr Acid in Water (ppm ae) | | | | | |
|---|---|---|---|---|---|
| | Gallons of Renovate 3 per surface acre at specified depth | | | | |
| Water Depth (feet) | 0.75 ppm | 1.0 ppm | 1.5 ppm | 2.0 ppm | 2.5 ppm |
| 1 | 0.7 | 0.9 | 1.4 | 1.8 | 2.3 |
| 2 | 1.4 | 1.8 | 3.3 | 3.6 | 4.6 |
| 3 | 2.1 | 2.9 | 4.1 | 5.4 | 6.8 |
| 4 | 2.7 | 3.6 | 5.4 | 7.2 | 9.1 |
| 5 | 3.4 | 4.5 | 6.8 | 9.0 | 11.3 |
| 6 | 4.1 | 5.4 | 8.1 | 10.9 | 13.6 |
| 7 | 4.8 | 6.3 | 9.5 | 12.7 | 15.8 |
| 8 | 5.5 | 7.2 | 10.9 | 14.5 | 18.1 |
| 9 | 6.1 | 8.1 | 12.2 | 16.3 | 20.4 |
| 10 | 6.8 | 9.0 | 13.6 | 18.1 | 22.6 |
| 15 | 10.2 | 13.6 | 20.4 | 27.2 | 33.9 |
| 20 | 13.6 | 18.1 | 27.2 | 36.2 | 45.3 |

## 16.2 Common Aquatic Plants of Indiana

(See 2006 Management Plan)

## 16.3 Pesticide Use Restrictions Summary:

The following table was produced by Purdue University and included in the Professional Aquatic Applicators Training Manual. It gives a summary of water use restrictions on all major chemicals available for use in the aquatics market.

**Table 13: Pesticide Use Restrictions**

Table 1. Aquatic Herbicides and Their Use Restrictions. Always check the label because these restrictions are subject to change.

| | Human | | | Animal | Irrigation | | |
|---|---|---|---|---|---|---|---|
| | Drinking | Swimming | Fish Consumption | Drinking | Turf | Forage | Food Crops |
| | *waiting period, in days* | | | | | | |
| Copper Chelate | 0 | 0[a] | 0 | 0 | 0 | 0 | 0 |
| Copper Sulfate | 0 | 0[a] | 0 | 0 | 0 | 0 | 0 |
| Diquat | 1–3 | 0[a] | 0 | 1 | 1–3 | 1–3 | 5 |
| Endothall (granular)[b] | 7 | 0[a] | 3 | 0 | 7 | 7 | 7 |
| Endothall (liquid)[b] | 7–25 | 0[a] | 3 | 7–25 | 7–25[d] | 7–25 | 7–25 |
| Endothall 191 (granular)[c] | 7–25 | 0[a] | 3 | 7–25 | 7–25 | 7–25 | 7–25 |
| Endothall 191 (liquid)[c] | 7–25 | 0[a] | 3 | 7–25 | 7–25 | 7–25 | 7–25 |
| Fluridone | 0[e] | 0[a] | 0 | 0 | 7–30 | 7–30 | 7–30 |
| Glyphosate | 0[e] | 0[a] | 0 | 0 | 0 | 0 | 0 |
| 2,4-D (granular) | * | 0[a] | 0 | * | * | * | * |

[a]Although this compound has no waiting period for swimming, it is always advisable to wait 24 hours before permitting swimming in the direct area of treatment.
[b]Trade name is Aquathol®.
[c]Trade name is Hydrothol®.
[d]May be used for sprinkling bent grass immediately.
[e]Do not apply this product within 1/4 (fluridone) to 1/2 (glyphosate) mile upstream of potable water intakes.
*Do not use treated water for domestic purposes, livestock watering (2,4-D, dairy animals only), or irrigation.

## 16.4 Resources for Aquatic Management

In addition to the LARE Program, there are many other sources of potential funding to help improve the quality of Indiana Lakes. Many government agencies assist in projects designed to improve environmental quality.

The USDA has many programs to assist environmental improvement. More information on the following programs can be found at www.usda.gov.

Watershed Protection and Flood Prevention Program (USDA

Conservation Reserve Program (USDA)

Wetlands Reserve Program (USDA)

Grassland Reserve Program (USDA)

Wildlife Habitat Incentive Program (USDA)

Small Watershed Rehabilitation Program (USDA)

The following programs are offered by the U.S. Fish and Wildlife Service. More information about the Fish and Wildlife service can be found at www.fws.gov

Partners for Fish and Wildlife Program (U.S. Fish and Wildlife Service)

Bring Back the Natives Program ( U.S. Fish and Wildlife Service)

Native Plant Conservation Program (U.S. Fish and Wildlife Service)

The Environmental Protection Agency, the Indiana Department of Environmental Management, and the U.S. Forest Service also have numerous programs for funding. A few of these are listed below. More information can be found at www.in.gov/idem and www.fs.fed.us/

U.S. Environmental Protection Agency Environmental Education Program (EPA)

NPDES Related State Program Grants (IDEM)

Community Forestry Grant Program (U.S. Forest Service)

## 16.5 State Regulations for Aquatic Plant Management

The following information is found on the IDNR website and outlines general regulations for the management of aquatic plants in public waters.

**AQUATIC PLANT CONTROL PERMIT REGULATIONS**
Indiana Department of Natural Resources

Note: In addition to a permit from IDNR, public water supplies cannot be treated without prior written approval from the IDEM Drinking Water Section. **Amended state statute adds biological and mechanical control (use of weed harvesters) to the permit requirements, reduces the area allowed for treatment without a permit to 625 sq ft, and updates the reference to IDEM.** *These changes become effective on July 1, 2002.*

**Chapter 9. Regulation of Fishing**
**IC 14-22-9-10**

Sec. 10. (a) This section does not apply to the following:

(1) A privately owned lake, farm pond, or public or private drainage ditch.

(2) A landowner or tenant adjacent to public waters or boundary waters of the state, who chemically, mechanically, or physically controls aquatic vegetation in the immediate vicinity of a boat landing or bathing beach on or adjacent to the real property of the landowner or tenant if the following conditions exist:

(A) The area where vegetation is to be controlled does not exceed:

(i) twenty-five (25) feet along the legally established, average, or normal shoreline;

(ii) a water depth of six (6) feet; and

(iii) a total surface area of six hundred twenty-five (625) square feet.

(B) Control of vegetation does not occur in a public waterway of the state.

(b) A person may not chemically, mechanically, physically, or biologically control aquatic vegetation in the public waters or boundary waters of the state without a permit issued by the department. All procedures to control aquatic vegetation under this section shall be conducted in accordance with rules adopted by the department under IC 4-22-2.

(c) Upon receipt of an application for a permit to control aquatic vegetation and the payment of a fee of five dollars ($5), the department may issue a permit to the applicant. However, if the aquatic vegetation proposed to be controlled is present in a public water supply, the department may not, without prior written approval from the department of environmental management, approve a permit for control of the aquatic vegetation.

(d) This section does not do any of the following:

(1) Act as a bar to a suit or cause of action by a person or governmental agency.

(2) Relieve the permittee from liability, rules, restrictions, or permits that may be required of the permittee by any other governmental agency.

(3) Affect water pollution control laws (as defined in IC 13-11-2-261) and the rules adopted under water pollution control laws (as defined in IC 13-11-2-261).

As added by P.L.1-1995, SEC.15. Amended by P.L.1-1996, SEC.64.

**312 IAC 9-10-3 Aquatic vegetation control permits**

Authority: IC 14-22-2-6; IC 14-22-9-10

Affected: IC 14-22-9-10

Sec. 3. (a) Except as provided under IC 14-22-9-10(a), a person shall obtain a permit under this section before applying a substance to waters of this state to seek aquatic vegetation control.

(b) An application for an aquatic vegetation control permit shall be made on a departmental form and must include the following information:

(1) The common name of the plants to be controlled.

(2) The acreage to be treated.

(3) The maximum depth of the water where plants are to be treated.

(4) The name and amount of the chemical to be used.

(c) A permit issued under this section is limited to the terms of the application and to conditions imposed on the permit by the department.

(d) Five (5) days before the application of a substance permitted under this section, the permit holder must post clearly, visible signs at the treatment area indicating the substance that will be applied and what precautions should be taken.

(e) A permit issued under this section is void if the waters to be treated are supplied to the public by a private company or governmental agency. *(Natural Resources Commission; 312*

## 16.6 Public Questionnaire

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Lake Use Survey (15 total)  Lake name Shipshewana

Are you a lake property owner? Yes 15 No 0

Are you currently a member of your lake association? Yes 14 No 1

How many years have you been at the lake?
- 2 or less - 1
- 2 – 5 years - 3
- 5-10 years - 4
- Over 10 years - 7

How do you use the lake (mark all that apply)
- 5 Swimming
- 13 Boating
- 15 Fishing
- 0 Irrigation
- 0 Drinking water
- 0 Other ______

Do you have aquatic plants at your shoreline in nuisance quantities? Yes 3 No 9

Do you currently participate in a weed control project on the lake? Yes 9 No 2

Does aquatic vegetation interfere with your use or enjoyment of the lake? Yes 9 No 5

Does the level of vegetation in the lake affect your property values? Yes 13 No 2

Are you in favor of continuing efforts to control vegetation on the lake? Yes 14 No 0

Are you aware that the LARE funds will only apply to work controlling invasive exotic species, and more work may need to be privately funded? Yes 13 No 1

Mark any of these you think are problems on your lake:
- 0 Too many boats access the lake
- 0 Use of jet skis on the lake
- 0 Too much fishing
- 0 Fish population problem
- 4 Dredging needed
- 0 Overuse by nonresidents
- 6 Too many aquatic plants
- 0 Not enough aquatic plants
- 6 Poor water quality
- 2 Pier/funneling problem

Please add any comments:
Deeper lake = less problem; bad errosion on channel shoreline reducing property line edge - what can be done to fill tot back in to prevent further erosion; weed control has helped; 1st season of lake with aquatic treatment appears successful; 2006 efforts in July = castastrophe; end up with large biomass on southside; we're pleased with weed control this year - hopefully will continue. Need more weed banks + aquatic plants control (lilly pads + cattails).

## 16.7 Species Distribution Maps

**Figure 10: 2007 Tier II Sample Locations**

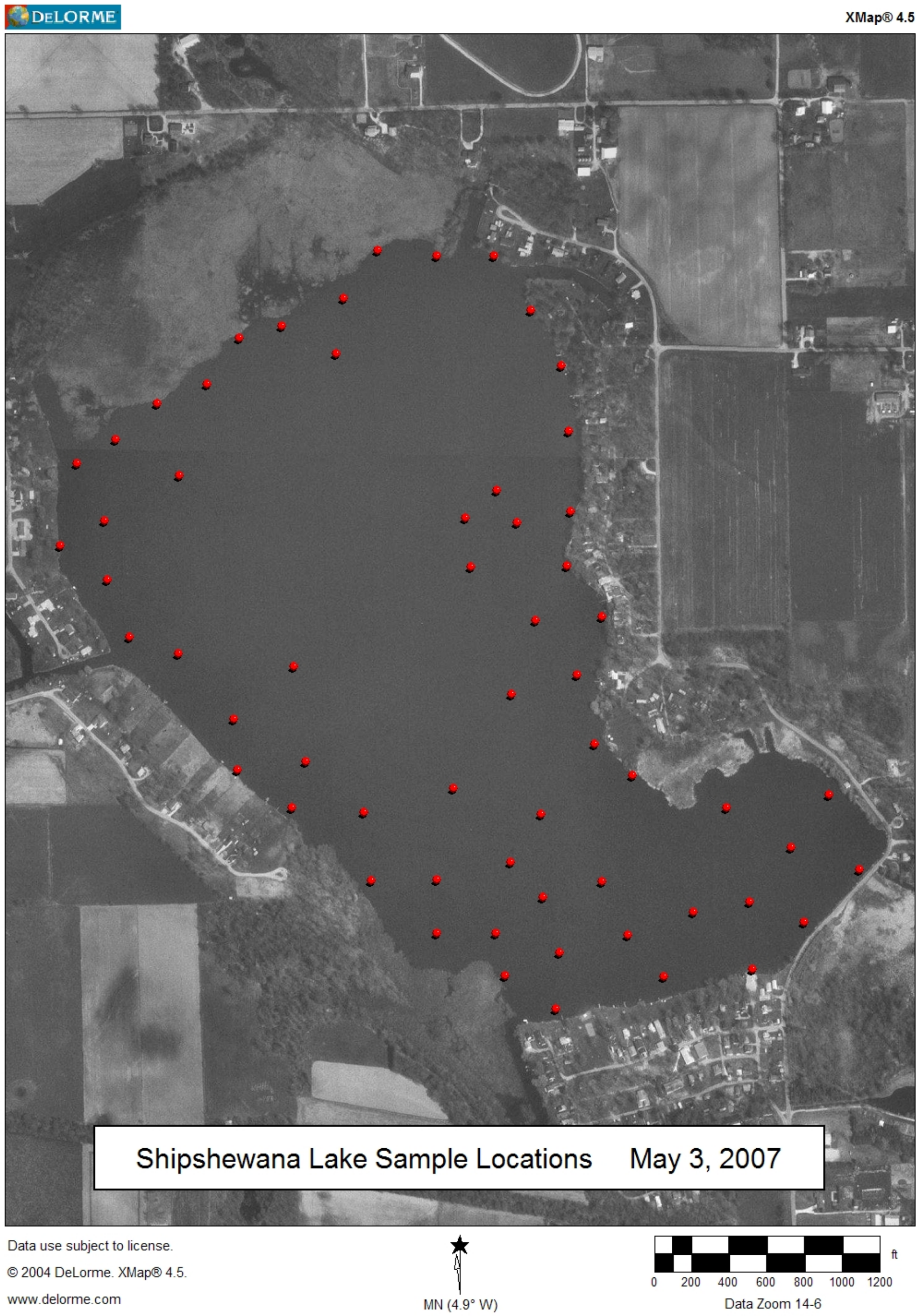


**Figure 11: May 2007 Eurasian Watermilfoil Locations**

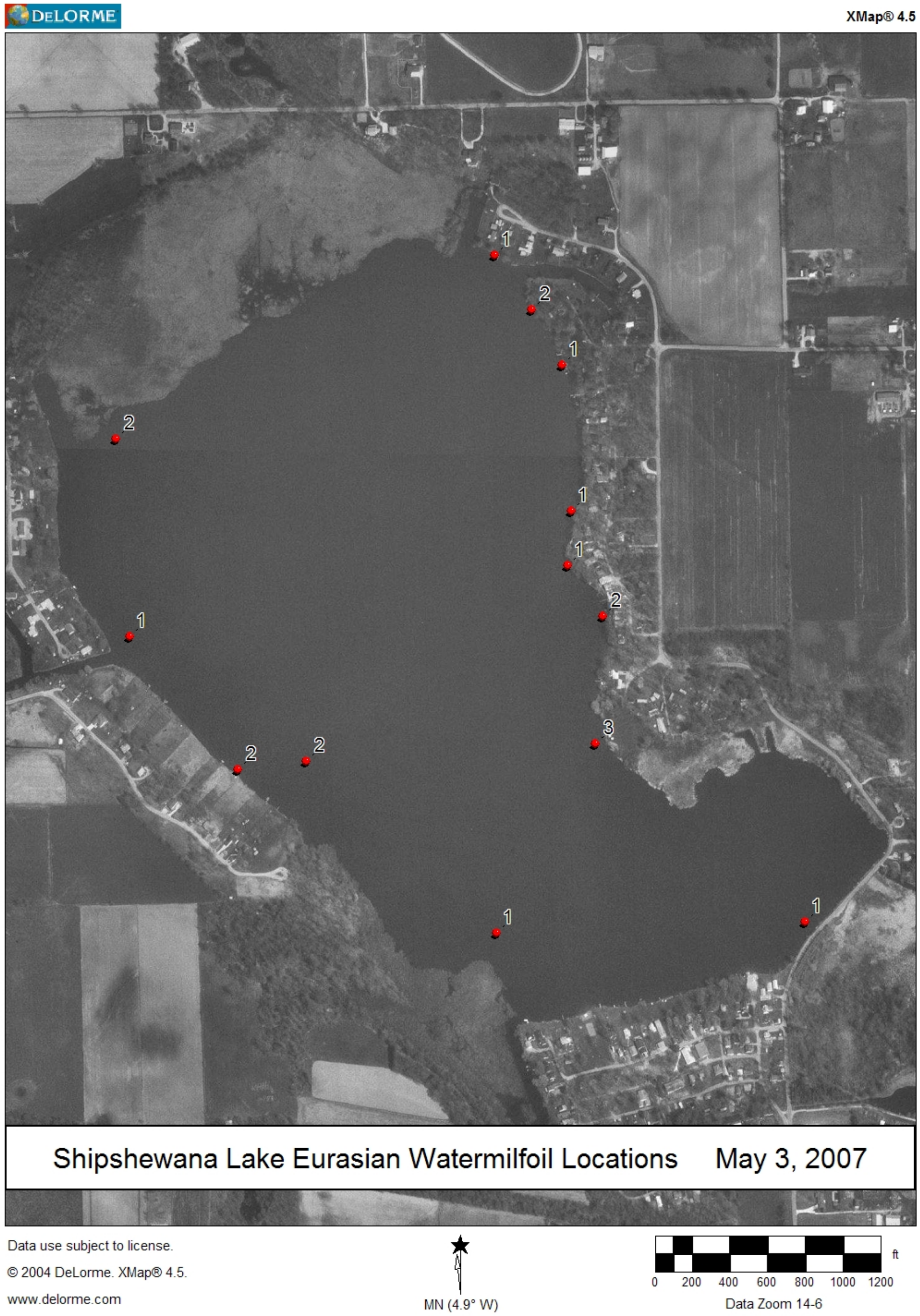


**Figure 12: May 2007 Coontail Locations**

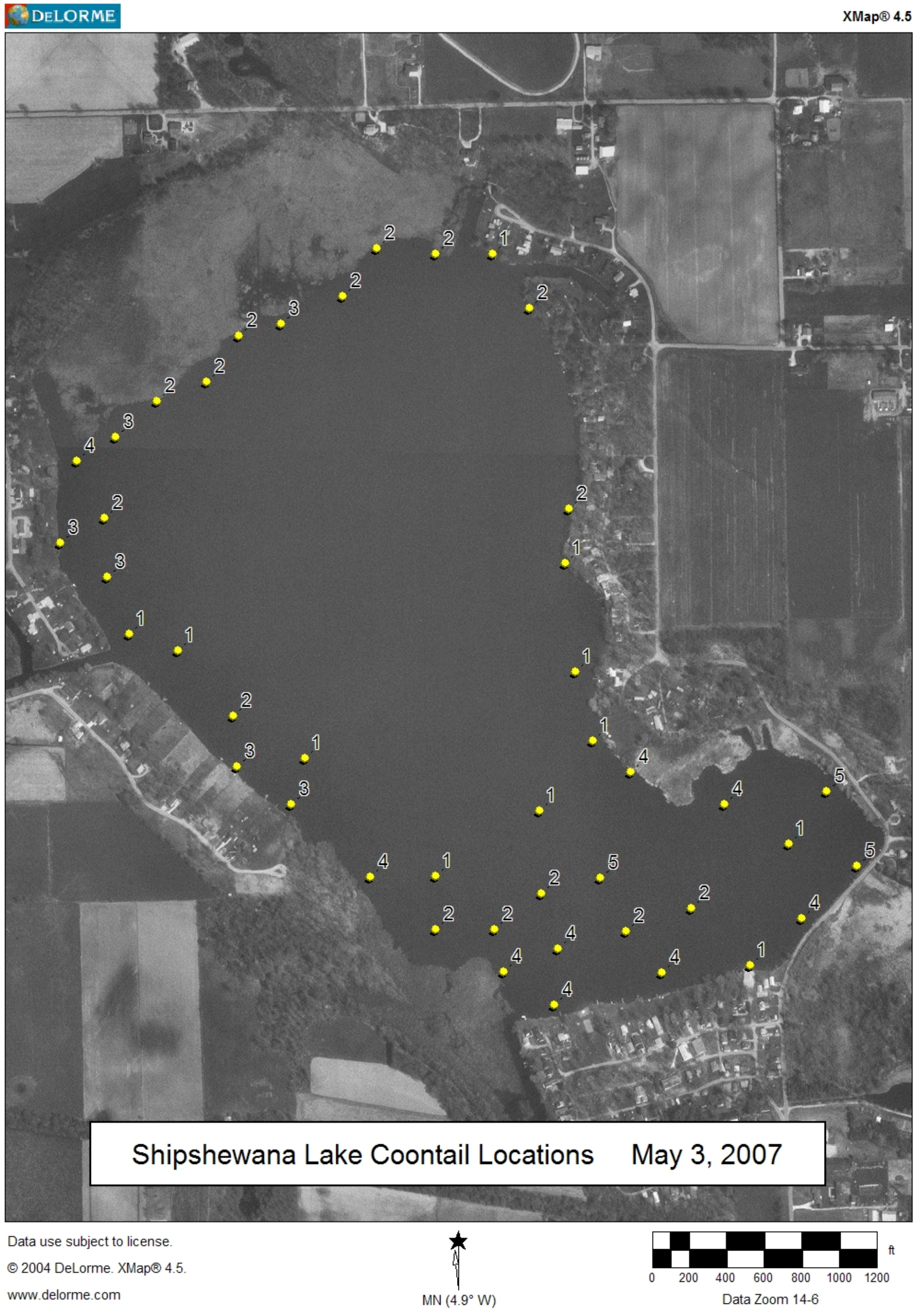
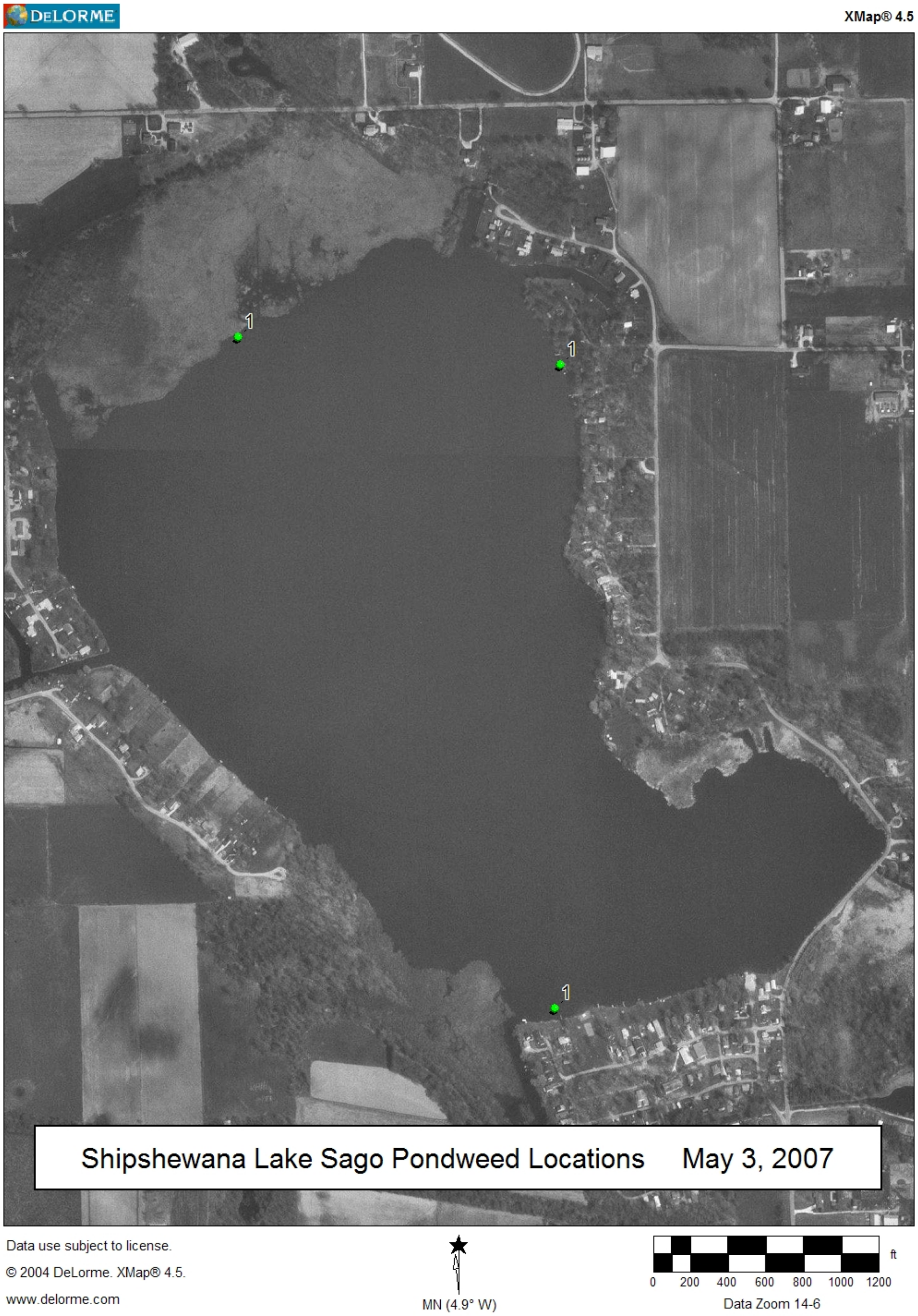


**Figure 13: May 2007 Curly Leaf Pondweed Locations**

**Figure 14: May 2007 Elodea Locations**

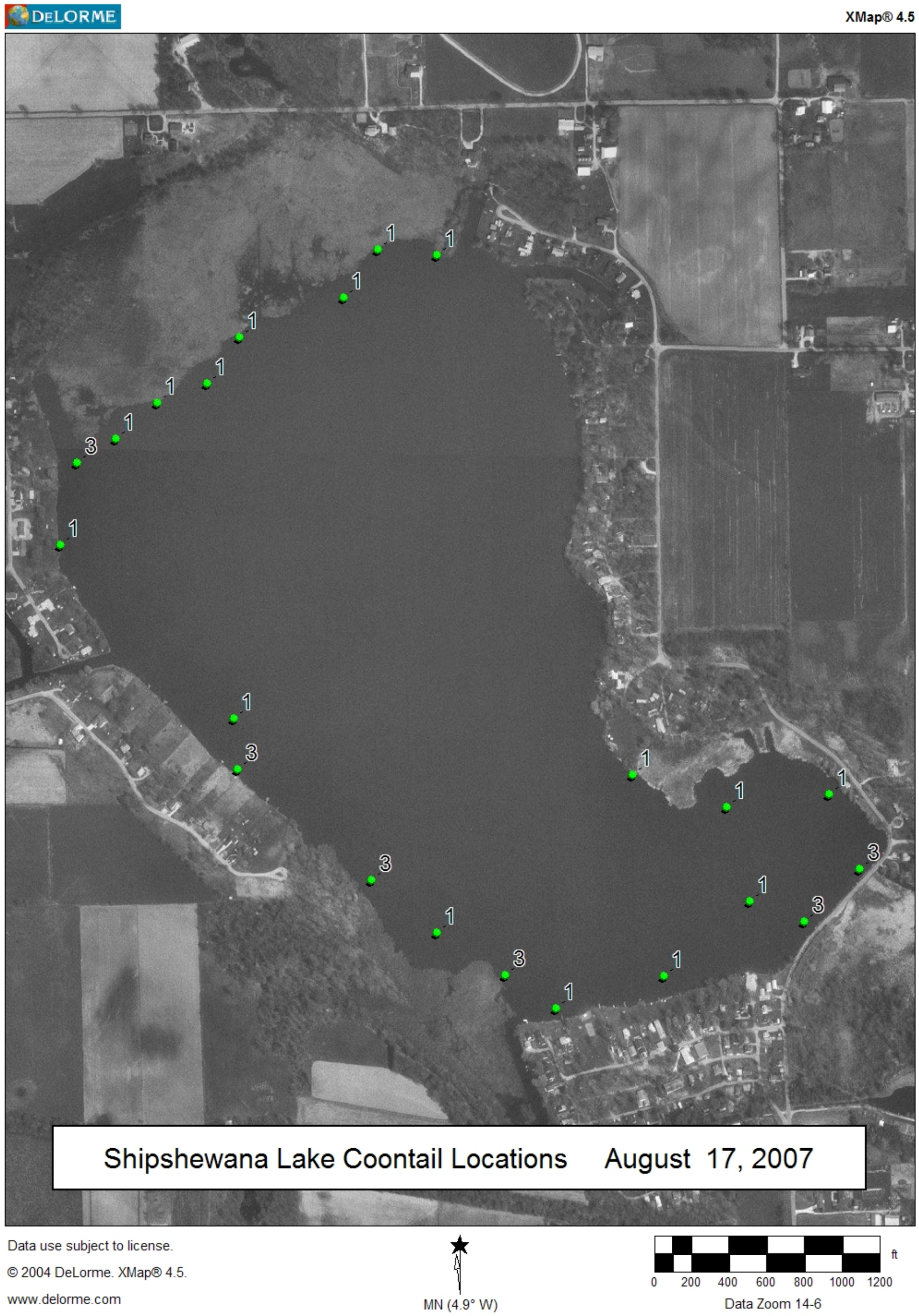
**Figure 15: May 2007 Sago Pondweed Locations**



# August 2007

**Figure 16: August 2007 Sago Pondweed Locations**

**Figure 17: August 2007 Coontail Locations**



## 16.8 Data Sheets

10

**Aquatic Vegetation Random Sampling**

**Waterbody Cover Sheet**

Organization Name: Shipshewan Community Lake Improvement Association

Waterbody Name: Shipshewana Lake

Lake ID:

County: Lagrange County

Date: May 3, 2007

Habitat Stratum: IL

Ave. Lake Depth (ft): 7

Lake Level: Avg

**GPS Metadata**

Datum: NAD83

Zone: 16

Accuracy: 30 ft

Crew Leader: Dave Keister

Recorder: Dave Keister

Method: WAAS Enabled GPS

Secchi Depth (ft): 2.5

Total # of Sites Surveyed: 60

Total # of Species: 5

Littoral Zone Size (acres): 75

- ☐ Measured
- ☒ Estimated

Littoral Zone Max. Depth (ft): 6

- ☐ Measured
- ☐ Estimate (historical Secchi)
- ☒ Estimated (current Secchi)

Notable Conditions:
Secchi depth was measured at 2.5 ft
Water Temperature 64°
Planktonic Algae already starting

**APPENDIX A**

Submersed Aquatic Plant Survey Form

Page 1 of 2 11

WATER BODY NAME Shipshewana Lake
SECCHI 2.5
COUNTY Lagrange
MAX PLANT DEPTH ~6 ft
DATE May 3, 2007
WEATHER Sunny, Breezy 60°
CREW LEADER Dave
COMMENTS water temp 64° Some Planktonic Algae Already
RECORDER Dave

Rake score (1, 3, 5), observed only (9), algae present (p)
Use acronyms for species, V1, V2…for voucher codes

| Site | Latitude | Longitude | Depth | All | Species Code: CEDE4 | MYSP2 | POPE6 | | | | | | | Note: Algae |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | GPS | Points | 2 | 1 | 1 | | | | | | | | | P |
| 2 | | | 3 | 4 | 4 | 1 | | | | | | | | P |
| 3 | | | 4 | 5 | 5 | | | | | | | | | |
| 4 | | | 4 | 5 | 5 | | | | | | | | | |
| 5 | | | 3 | 4 | 4 | | | | | | | | | P |
| 6 | | | 2 | 4 | 4 | | | | | | | | | P |
| 7 | | | 3 | 3 | 1 | 3 | | | | | | | | P |
| 8 | | | 4 | 1 | 1 | | | | | | | | | |
| 9 | | | 3 | 2 | | 2 | | | | | | | | |
| 10 | | | 4 | 1 | 1 | 1 | | | | | | | | |
| 11 | | | 3 | 2 | 2 | 1 | | | | | | | | P |
| 12 | | | 7 | 0 | | | | | | | | | | |
| 13 | | | 5 | 0 | | | | | | | | | | |
| 14 | | | 4 | 2 | | 1 | 1 | | | | | | | P |
| 15 | | | 2 | 3 | 2 | 2 | | | | | | | | P |
| 16 | | | 2 | 2 | 1 | 1 | | | | | | | | P |
| 17 | | | 3 | 2 | 2 | | | | | | | | | |
| 18 | | | 4 | 2 | 2 | | | | | | | | | |
| 19 | | | 4 | 2 | 2 | | | | | | | | | |
| 20 | | | 6 | 0 | | | | | | | | | | |
| 21 | | | 4 | 3 | 3 | | | | | | | | | |
| 22 | | | 2 | 2 | 2 | | 1 | | | | | | | P |
| 23 | | | 5 | 2 | 2 | | | | | | | | | |
| 24 | | | 3 | 2 | 2 | | | | | | | | | P |
| 25 | | | 7 | 0 | | | | | | | | | | |
| 26 | | | 5 | 4 | 3 | 2 | | | | | | | | |
| 27 | | | 4 | 4 | 4 | | | | | | | | | |
| 28 | | | 5 | 2 | 2 | | | | | | | | | P |
| 29 | | | 5 | 3 | 3 | | | | | | | | | P |
| 30 | | | 4 | 3 | 3 | | | | | | | | | P |
| 31 | | | 4 | 2 | 1 | 1 | | | | | | | | P |
| 32 | | | 5 | 1 | 1 | | | | | | | | | |
| Other plant species observed at lake | | | | | | | | | | | | | | |

**APPENDIX A**

Submersed Aquatic Plant Survey Form

Page 2 of 2[11]

WATER BODY NAME Shipshewana Lake
SECCHI 2.5
COUNTY Lagrange
MAX PLANT DEPTH ~6 ft
DATE May 3, 2007
WEATHER Sunny, Breezy 60°
CREW LEADER Dave
COMMENTS water temp 64°
RECORDER Dave

Rake score (1, 3, 5), observed only (9), algae present (p)
Use acronyms for species, V1, V2…for voucher codes

| | | | | | Species Code | | | | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | Latitude | Longitude | Depth | All | CEDE4 | MVSP2 | POPE6 | POCR3 | V 1 | | | | | Algae |
| 33 | GPS | Points | 7 | 0 | | | | | | | | | | |
| 34 | | | 4 | 2 | 2 | | | | | | | | | p |
| 35 | | | 4 | 4 | 3 | 2 | | | | | | | | |
| 36 | | | 5 | 3 | 1 | 2 | | | | | | | | p |
| 37 | | | 4 | 3 | 3 | | | | | | | | | |
| 38 | | | 5 | 0 | | | | | | | | | | |
| 39 | | | 8 | 0 | | | | | | | | | | |
| 40 | | | 5 | 4 | 4 | | | | | | | | | |
| 41 | | | 5 | 1 | 1 | | | | | | | | | |
| 42 | | | 5 | 2 | 2 | | | | | | | | | |
| 43 | | | 5 | 2 | 2 | 1 | | | | | | | | |
| 44 | | | 5 | 0 | | | | | | | | | | |
| 45 | | | 6 | 1 | 1 | | | | | | | | | |
| 46 | | | 5 | 2 | 2 | | | | | | | | | |
| 47 | | | 3 | 4 | 4 | | | | | | | | | p |
| 48 | | | 5 | 4 | 4 | | | | | | | | | |
| 49 | | | 3 | 5 | 4 | | 1 | | | | | | | p |
| 50 | | | 4 | 5 | 5 | | | 1 | | | | | | |
| 51 | | | 5 | 2 | 2 | | | | | | | | | |
| 52 | | | 4 | 4 | 4 | | | | V1 | | | | | |
| 53 | | | 4 | 2 | 2 | | | | | | | | | |
| 54 | | | 6 | 0 | | | | | | | | | | |
| 55 | | | 5 | 1 | 1 | | | | | | | | | |
| 56 | | | 7 | 0 | | | | | | | | | | |
| 57 | | | 8 | 0 | | | | | | | | | | |
| 58 | | | 5 | 0 | | | | | | | | | | |
| 59 | | | 9 | 0 | | | | | | | | | | |
| 60 | | | 5 | 0 | | | | | | | | | | |

Other plant species observed at lake

## Tier II Rake Sample GPS Coordinates

| Site | Latitude | Longitude |
|---|---|---|
| 1 | 41.68165 | -85.601 |
| 2 | 41.68233 | -85.6 |
| 3 | 41.6831 | -85.5989 |
| 4 | 41.68419 | -85.5995 |
| 5 | 41.684 | -85.6015 |
| 6 | 41.68447 | -85.6033 |
| 7 | 41.68493 | -85.6041 |
| 8 | 41.68594 | -85.6044 |
| 9 | 41.68679 | -85.6039 |
| 10 | 41.68753 | -85.6046 |
| 11 | 41.68831 | -85.6045 |
| 12 | 41.68862 | -85.606 |
| 13 | 41.68949 | -85.6045 |
| 14 | 41.69044 | -85.6047 |
| 15 | 41.69124 | -85.6053 |
| 16 | 41.69203 | -85.606 |
| 17 | 41.69204 | -85.6071 |
| 18 | 41.69212 | -85.6083 |
| 19 | 41.69142 | -85.6089 |
| 20 | 41.69061 | -85.6091 |
| 21 | 41.69101 | -85.6101 |
| 22 | 41.69084 | -85.611 |
| 23 | 41.69017 | -85.6116 |
| 24 | 41.68989 | -85.6126 |
| 25 | 41.68884 | -85.6121 |
| 26 | 41.68937 | -85.6134 |
| 27 | 41.68901 | -85.6141 |
| 28 | 41.68818 | -85.6136 |
| 29 | 41.68782 | -85.6145 |
| 30 | 41.68731 | -85.6135 |
| 31 | 41.68649 | -85.6131 |
| 32 | 41.68625 | -85.6122 |
| 33 | 41.68606 | -85.6099 |
| 34 | 41.6853 | -85.6111 |
| 35 | 41.68456 | -85.611 |
| 36 | 41.68468 | -85.6097 |
| 37 | 41.68401 | -85.6099 |
| 38 | 41.68394 | -85.6085 |
| 39 | 41.68428 | -85.6068 |
| 40 | 41.68294 | -85.6084 |
| 41 | 41.68295 | -85.6071 |
| 42 | 41.68218 | -85.6071 |
| 43 | 41.68218 | -85.606 |
| 44 | 41.68321 | -85.6057 |
| 45 | 41.68391 | -85.6051 |
| 46 | 41.6827 | -85.605 |
| 47 | 41.68156 | -85.6058 |
| 48 | 41.68189 | -85.6047 |
| 49 | 41.68107 | -85.6048 |
| 50 | 41.68293 | -85.6039 |
| 51 | 41.68215 | -85.6034 |
| 52 | 41.68154 | -85.6027 |
| 53 | 41.68248 | -85.6021 |
| 54 | 41.68264 | -85.601 |
| 55 | 41.68342 | -85.6002 |

| | | |
|---|---|---|
| 56 | 41.68566 | -85.6057 |
| 57 | 41.68673 | -85.6052 |
| 58 | 41.68751 | -85.6064 |
| 59 | 41.68822 | -85.6066 |
| 60 | 41.68816 | -85.6056 |

## 16.9 IDNR Aquatic Vegetation Control Permit

To be included in Final Draft